

Case Report

Single visit root canal treatment with post crown restoration

Kun Ismiyatin,¹ Widya Saraswati,¹ Febriastuti Cahyani,¹ Olivia Vivian Widjaya², Dede Ghozali Pangestu³, Dea Arshila³

¹Department of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

²Resident of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

³Undergraduate Student, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

ABSTRACT

Background: Single visit endodontics has been shown to be an effective treatment modality when compared with multiple visit therapy and it does not deviate from achieving the objectives of proper biomechanical preparation, debridement, shaping, disinfection and 3 dimensional obturation of root canal system and is more beneficial to the patient and dentist provided there is careful case selection and strict follow of standard endodontic protocols. Symptomatic teeth can also be managed by single visit after controlling the abscess infection with antibiotic, provided the root canal is dry without any discharge. **Purpose:** This study aims to perform single visit root canals on teeth with irreversible pulpitis and restoration with post core and crown. **Case:** A 48-years-old female comes with dental complaints of upper left rear spontaneous pain at night. The tooth has had cavities since about two years ago and has never been previously treated. The patient said had not any systematic health disorder. There is a spontaneous pain that the patient feels. **Case Management:** From the examination that has been carried out, a clinical diagnosis of tooth 25 were symptomatic pulpitis irreversible with normal apical tissue. The restoration endodontic treatment plan was a single visit endodontic and the restoration is post core and crown. **Conclusion:** Symptomatic pulpitis irreversible with normal apical tissue treatment can be carried out single visit root canal treatment. Restoration of post endodontic treatment in this case need fiber post and core using composite and finally restoration using crown that made of zirconia. Zirconia has a higher level of material resistance than lithium disilicate. This is what makes zirconia the choice, especially for posterior teeth.

Keywords: single visit endodontic; zirconia; indirect restoration; post crown

Correspondence: Kun Ismiyatin, Department of Conservative Dentistry, Faculty of Dental Medicine, Universitas Airlangga. Jl. Mayjen Prof. Dr. Moestopo no. 47, Surabaya 60132, Indonesia. E-mail: kun-is@fkg.unair.ac.id

INTRODUCTION

Single-visit endodontic therapy is defined as ‘the conservative non-surgical treatment of an endodontically involved tooth consisting of complete biomechanical cleansing, shaping and obturation of the root canal system during one visit’. With the new instrumentation techniques, material science and technology, it is no more an empirical procedure for obturation of root canals.¹ While performing single visit endodontics, the objective is to perform the treatment in minimum time without compromising the quality of treatment. To achieve this goal use of conventional access cavity preparation by using hand piece and new burs along with use of ultrasonic system can be considered, as visibility will be better and also more effective in exploring canal orifices and calcifications present. Symptomatic teeth can also be managed by single visit after controlling the abscess infection with antibiotic, provided the root canal is dry without any discharge. So with recent advances single visit endodontics has been shown to be an effective treatment

modality when compared with multiple visit therapy and it does not deviate from achieving the objectives of proper biomechanical preparation, debridement, shaping, disinfection and 3 dimensional obturation of root canal system and is more beneficial to the patient and dentist provided there is careful case selection and strict follow of standard endodontic protocols.²

Caries is the major cause of pulp inflammation. As soon as the caries biofilm destroys enamel and reaches dentin, subtle inflammatory changes are already evident near the pulp border adjacent to the affected dentinal tubules. As the caries lesion progresses deep in dentin and towards to the pulp, the severity of pulp inflammation increases. When the pulp tissue is frankly exposed to the caries biofilm, a severe inflammatory reaction develops, often resulting in localized abscesses. At this point, pulpitis is regarded as irreversible in the sense that only removal of the cause (caries) does not suffice to promote pulp healing. The condition is not always painful; actually, irreversible pulpitis is usually asymptomatic. When present, symptoms

can vary in intensity and duration; in some cases, pain can be spontaneous, severe, diffuse, and difficult to control with analgesics, requiring emergency treatment.³

Symptomatic irreversible pulpitis is based on subjective and objective findings that the vital inflamed pulp is incapable of healing and that root canal treatment is indicated. Characteristics may include sharp pain upon thermal stimulus, lingering pain (often 30 seconds or longer after stimulus removal), spontaneity (unprovoked pain) and referred pain. Sometimes the pain may be accentuated by postural changes such as lying down or bending over and over-the-counter analgesics are typically ineffective. Common etiologies may include deep caries, extensive restorations, or fractures exposing the pulpal tissues. Teeth with symptomatic irreversible pulpitis may be difficult to diagnose because the inflammation has not yet reached the periapical tissues, thus resulting in no pain or discomfort to percussion. In such cases, dental history and thermal testing are the primary tools for assessing pulpal status.⁴

Treatment with post crowns is a type of restoration that is often performed in daily dentist practice. Teeth requiring post crown restoration are usually due to extensive damage and need root canal treatment, so it is feared that they will not be strong enough if they are only filled or jacket crowns are made. Placement of jacket crowns on non-vital teeth is inappropriate because of the increased fragility of the dentin and because of the loss of supporting dentin due to the access required for root canal treatment. In such situations a post crown is a good treatment option.⁵

Due to an increasing interest in aesthetics and concerns about toxic and allergic reactions to certain alloys, zirconia was proposed as a new ceramic material in the later part of 20th century. It has become a popular alternative to alumina as biomaterial and is used in dental applications for fabricating endodontic posts, crown and It has become a popular alternative to alumina as biomaterial and is used in

dental applications for fabricating endodontic posts, crown and bridge restorations and implant abutments.⁶

This case describes a series of one-visit root canal treatment planning using the Crown Down Pressureless preparation technique with a post-crown fixed restoration using fiber post and zirconia material as a single crown.

CASE

A 48-years-old female came to the Dental Hospital of Airlangga University. Patient come with dental complaints of upper left rear spontaneous pain at night. The tooth has had cavities since about two years ago and has never been previously treated. The patient said had not any systematic health disorder. There is a spontaneous pain that the patient feels.

The results of intraoral examination revealed that the patient had a normal posterior cusp to fossa and anterior relation with an overjet and overbite value of 2 mm each. Salivary test results showed that the quality and quantity of the patient’s saliva were still within normal limits (Table 1). On objective examination, there were 25 deep carious tooth with normal gingival conditions (Figure 1). The bite test and percussion were negative.

In the EPT vitality test, tooth 25 as a control reacted at number 4, while on the vitality test, tooth 25 reacted at number 5. It can be concluded that tooth 25 is vital. From the examination that has been carried out, a clinical diagnosis of tooth 25 were symptomatic pulpitis irreversible with normal apical tissue. The restoration treatment plan was a single visit root canal treatment, with the final restoration being fiber post installation, core fabrication and crown restoration made of zirconia. The prognosis of treatment was good because the teeth are successful for endodontic treatment and a straight root canal.

Table 1. Salivary test results in patients

Hydration	35 sec	●
Viscosity	bubbly	●
pH	7	●
Quantity	7 ml	●
Buffer Capacity	12	●

CASE MANAGEMENT

Treatment was carried out during the Covid-19 pandemic in a negative pressure room, using aerosol suction, operators using level 3 personal protective equipment (PPE) and the patients using disposable gowns and nurse cap. Operator, assistant operator and patient perform antigen swab before treatment. On the first visit, The patient was instructed to

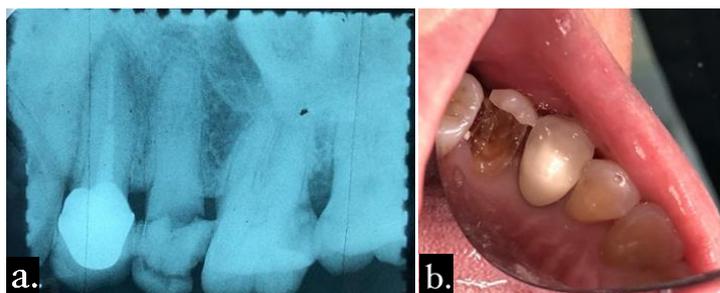


Figure 1. The condition of deep carious teeth before the treatment. a.) Initial clinical radiograph; b.) initial photo.

rinse his mouth with 1% povidone-iodine solution for 30 seconds. Operator ask the patient for anamnesis, objective examination, supporting examination and diagnosis. The saliva test, IEC, and DHE were performed on the patient, and the patient received informed consent and informed consent as a form of approval for the treatment to be carried out. The patient was given a local infiltration anesthesia, then proceed with the history and diagnosis stage. The working area was isolated using a rubber dam. The next step is rewalling of tooth 25 by performing access opening using an endo access bur (Figure 2a). Then, negotiation of the root canal using K-File #10 followed by measuring the working length using K-File #10 and apex locator (buccal 22mm,

palatal 21mm) (Figure 2b). For the Instrumentation was using proglider (16.02)(Figure 3a). The apical gauging got with k-files #25 (Figure 3b). Root canal preparation using rotary file protaper next until file X2 (25/06) (Figure 4a). Irrigation sequences used 2.5% NaOCl for each file change and were recapitulated using k-file #10 (Figure 4b). Gutta point trial (25/06) and radiographically confirmed. Final irrigation sequence consisting of 2.5% NaOCl, 17% EDTA and distilled water, Activation of irrigation materials using ultrasonic (Figure 4c). The root canals are dried with endo suction and paper points continued with filling of the root canal using the single cone technique gutta point (25/06) and resin based sealer (Figure 5). Provisional placement

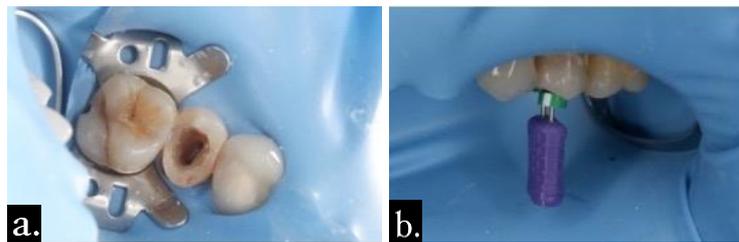


Figure 2. a.) Rewalling of tooth 25; b.) Negotiation instrumentation with kfile 10.

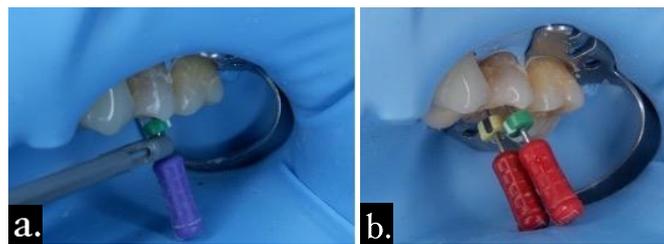


Figure 3. a.) Working length measurement with apex locator; b.) Apical gauging measurements.

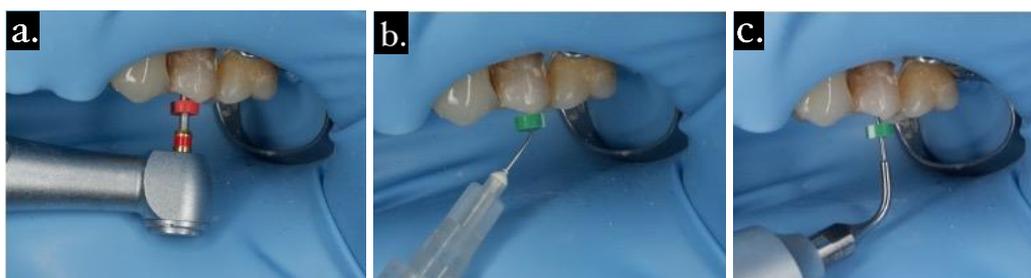


Figure 4. a.) Root canal preparation to X2; b.) Root canal irrigation; c.) Irrigation activation using ultrasonic.

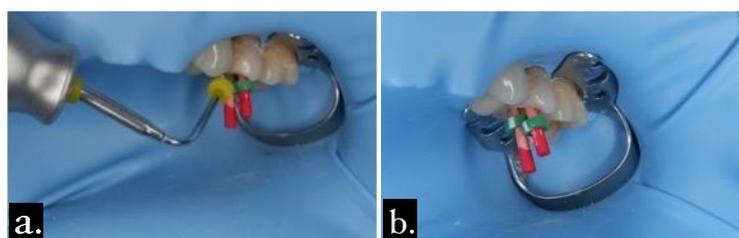


Figure 5. a.) Trial gutta point (25/06); b.) Gutta point obturation (25/06).

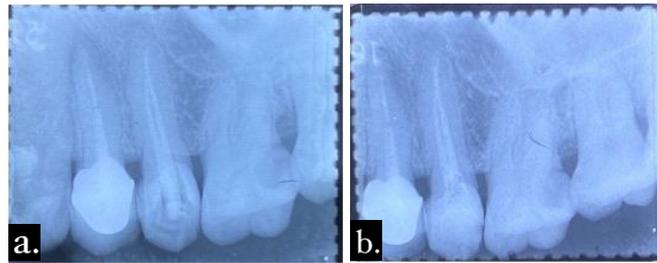


Figure 6. a.) Trial gutta point radiograph; b.) Obturation radiograph.



Figure 7. Shade Taking with 3M2.



Figure 9. Impression of maxillary.



Figure 8. a.) Occlusal preparation results; b.) Buccal preparation results; c.) Buccal preparation results in radiograph.

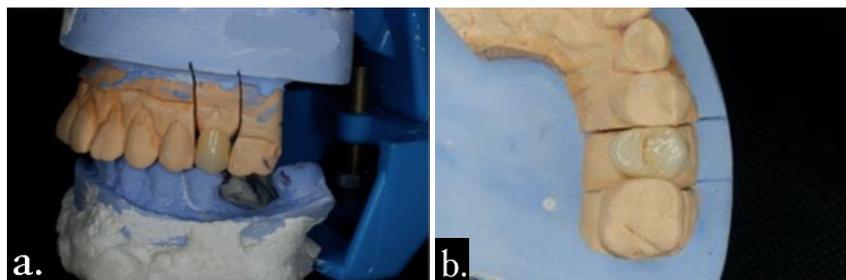


Figure 11. Crown on working model a.) buccal; b.) occlusal.



Figure 12. Post Insertion a.) buccal; b.) occlusal.

and confirmation of obturation by radiograph as shown in Figure 6.

On the second visit, the patient did not feel any complaints in the anamnesis, and there were no extraoral abnormalities. The results of the intraoral examination showed that percussion and bite test were negative, temporary filling was in good condition, and gingiva around the teeth was normal. The shade taking was done using the Vita 3D Master Shade Guide 3M2 (Figure 7). The work area was isolated by a rubber dam and the temporary filling was removed. After that, The patient asked to matching the size of the fiber post using a template. By taking 2/3 gutta percha points using a peeso reamer and calibration drill on tooth 25, and confirming with an X-ray. Then, the patient asked to try installing the fiber post on tooth 25 followed by universal bonding application to the root canal and light curing for 20 seconds. After that, Fiber post insertion and core build up on tooth 25 dual cure composite core material. The next stage is preparation for the manufacture of zirconia crowns and the preparation results, as shown in Figure 8. Gingival management using a retraction cord. Then, The teeth impressed the maxilla with two steps technique using an elastomer while the antagonist impressed with irreversible hydrocolloid impression (Figure 9). The next stage is making bite registration using polyvinyl siloxane followed by placing of temporary crown with bis acryl.

On the third visit, the temporary crown was removed for trial of the zirconia crown and adjustment of occlusion, proximal, adaptation of the restoration to the surrounding tissue (Figure 10). The working area was isolated with a rubber dam, the teeth were etched with 37% phosphoric acid for 20 seconds, rinsed and dried, then covered with universal bonding, and light cured for 20 seconds. Then, application of zirconia primer on the inner surface of the zirconia crown followed by inserting the zirconia tooth 25 crown using dual cure resin cement, cured for 2 seconds, the remaining cement was cleaned, followed by final light curing for 20 seconds (Figure 11). After remove the rubber dam, the final step were check occlusion, articulation, margin adaptation and proximal contact.

DISCUSSION

Root canal treatment is a treatment for pulp disease by taking vital or necrotic pulp from the root canal and replacing it with a filling material to prevent recurrence of infection. The goal of root canal treatment is to prevent the spread of disease from the pulp to the periapical tissue and restore the condition of the diseased tooth so that biologically acceptable to the surrounding tissue.⁷

One-visit root canal treatment, namely treatment that includes root canal cleaning, sterilization and obturation performed in one visit. Successful single-visit treatment saves time, reduces the risk of infection between visits and infrequent flare-ups. In this case report endodontic

treatment was carried out in one visit and continued with the installation of fiber posts and porcelain fused to metal restorations. Post is a metal or non-metal structure that is inserted into the root canal to improve retention of the crown and transmits the pressure received by the tooth evenly along the root. Based on the manufacture is divided into two, namely fabricated and prefabricated. Based on the material of manufacture is divided into two, namely metal and non-metal. Some non-metal post, namely the post of composite resin, ceramics and fiber reinforced polymers.⁸

The demand for aesthetic restorations has resulted in an increased use of dental ceramics for anterior and posterior restorations. The use of zirconia in crowns and bridges has increased over recent years, owing to aesthetic and biocompatibility demands.⁹ Moreover, it has excellent mechanical properties which make it more popular in the field of restorative dentistry than other ceramics.¹⁰ Its mechanical properties are the highest ever reported for any dental ceramic.¹¹ Zirconia has better mechanical properties compared with other ceramics, such as alumina, glass ceramics, and lithium disilicate. It is aesthetically superior and can be used in anterior, premolar, and molar areas. Zirconia crowns have shown a good marginal adaptation, giving the clinician an aesthetic alternative to metal ceramic crowns.¹²

In addition to the factors discussed above, another important complication reported in using zirconia-based restorations is the loss of retention. In vitro studies that evaluate approaches for promoting enhanced bond strength to zirconia substrate have shown that using an air-abrading strategy is mandatory with aluminum oxide particles or silica-coated aluminum oxide particles, followed by primers that facilitate both micromechanical interlocking of resin cement and chemical interactions with the involved substrates. Clinicians should be cautious in choosing the least aggressive protocol available for this, as a hazardous protocol may impair mechanical performance and predispose ceramic fracture. Therefore, all acquired scientific knowledge on fracture mechanics in bilayer zirconia in clinics calls attention to the demand for following strict processing guidelines and matching material characteristics to assure enhanced performance of such restorations, thus reducing the risk of chipping. Regarding monolithic zirconia, improvements in the optical characteristics and mechanical properties of the available materials may yield promising clinical outcomes. In the current case reports, failures were not found, and the patient satisfaction were reported in both cases after the 1-year follow-up.¹²

In this case the recovery was successful and the patient was satisfied with the result. In conclusion, Restoration of post endodontic treatment in this case needs fiber post and core using composite and finally restoration using a crown that is made of zirconia. Zirconia has a higher level of material resistance than lithium disilicate. This is what makes zirconia the choice, especially for the posterior teeth.

REFERENCES

1. Dennis C. Single Visit Endodontic in the Management of Symptomatic Irreversible Pulpitis and Pulp Necrosis with Apical Periodontitis: Report of Two Cases. *Int J Dentistry Oral Sci.* 2017; 4(2): 418-421.
2. Ahmed F, Thosar N, Baliga MS and Rathi N. Single Visit Endodontic Therapy: A Review. *Austin J Dent.* 2016; 3(2): 1035.
3. Rôças I, Alves F, Rachid C, Lima K, Assunção IV, Gomes PN, et al. Microbiome of Deep Dentinal Caries Lesions in Teeth with Symptomatic Irreversible Pulpitis. *PLOS ONE.* 2016; 11 (5): e0154653.
4. Endodontics colleagues for excellence. Chicago: American Association of Endodontists; 2013. Endodontics Diagnosis; pp. 1-4.
5. Santa M, Chandra A. Penanganan kedaruratan pada pulpitis ireversibel. *Makassar Dental Journal.* 2015; 4(5): 172-176.
6. Madfa AA, Al- Sanabani FA, Al-Qudami NH. Use of Zirconia in Dentistry: An Overview. *The Open Biomaterials Journal.* 2014; Volume 5.
7. Kartinawanti A, Asy'ari A. Penyakit pulpa dan perawatan saluran akar satu kali kunjungan. *JIKG (Jurnal Ilmu Kedokteran Gigi).* 2021; 4(2), 64-72.
8. Cheung W. A review of management of endodontically treated teeth. *J Am Dent Assoc.* 2005; 611-619
9. Rocha EP, Anchieta RB, Freitas-Junior AC, de Almeida EO, Cattaneo PM, Ko CC. Mechanical behavior of ceramic veneer in zirconia-based restorations: a 3-dimensional finite element analysis using microcomputed tomography data. *J Prosthet Dent.* 2011;105(1):14-20.
10. Coelho PG, Silva NR, Bonfante EA, Guess PC, Rekow ED, Thompson VP. Fatigue testing of two porcelain-zirconia all- ceramic crown systems. *Dent Mater.* 2009;25(9): 1122-1127.
11. Chazine M, Casucci A, Mazzoni A, Grandini S, Goracci C, Breschi L, Ferrari M. Interfacial nanoleakage and internal cement thickness of three esthetic crown systems. *Dent Mater.* 2012;28(10):1105-1111.
12. Alfawaz Y. Zirconia Crown as Single Unit Tooth Restoration: A Literature Review. *J Contemp Dent Pract* 2016;17(5): 418-422.